

CHROMOSOME NUMBERS IN *LAMPROTHAMNIUM*¹

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Synopsis

A comparison is made of the chromosome numbers of four species of *Lamprothamnium*, *L. papulosum*, *L. succinctum*, *L. macropogon* and *Lamprothamnium* sp., all polyploid, with the range of polyploid numbers in the related genus *Chara*. The possible use of chromosome number in the clarification of relationships and geographical distribution in *Lamprothamnium* is discussed.

Lamprothamnium J. Groves (1916) is a small genus of the family Characeae distributed in the Eastern Hemisphere from Europe through Africa and southern Asia to the Australasian region. It occurs in brackish water, usually quite close to the sea. Despite a widespread distribution and abundant records, the genus remains obscure in its relationships, and the limits of some species are uncertain (Ophel, 1947; Wood and Imahori, 1965). As stated by Wood (Wood and Imahori, 1965):

The status of genus *Lamprothamnium* is not clear. The species form a natural group and as such are accepted as a genus. On the other hand, *Lamp. succinctum* exhibits certain *Chara*-like features, especially the occurrence of oogonia above the antheridia, and the bract-cells and stipulodes are not huge as is so common in many forms of *Lamprothamnium*. It seems that this series of species is more similar to *Chara* subgen. *Charopsis* than subgen. *Charopsis* is to subgenus *Chara*. *Lamprothamnium* could well be construed to be a third subgenus of genus *Chara*, and be considered as derived recently from subgen. *Charopsis*.

Broadly based systematic studies are required for an evaluation of the position of *Lamprothamnium* in the Characeae. In the present paper, reports of cytological investigations (Hotchkiss, 1963, 1965) are continued with collections of *Lamprothamnium* from Europe and Australia. *Lamprothamnium papulosum* (Wallr.) J. Groves was collected in Denmark on September 5, 1965 and kindly sent by T. Christensen. Specimens of *Lamprothamnium* from the extensive

TABLE I
Chromosome Numbers Reported in the Genus Lamprothamnium

Species with conjoined gametangia

<i>Lamprothamnium papulosum</i> (Wallr.) J. Gr.	ca. 50	Europe (Lindenbein, 1927)
<i>Lamprothamnium papulosum</i> (Wallr.) J. Gr.	56	Denmark (present report)
<i>Lamprothamnium</i> sp.	28	Western Australia (Hotchkiss, 1963, as <i>L. macropogon</i>)

Species with disjunct gametangia

<i>Lamprothamnium succinctum</i> (A. Br. in Aesch.) Wood	42	New Caledonia (Hotchkiss, 1965)
<i>Lamprothamnium macropogon</i> (A. Br.) Ophel	56	South Australia (present report)

cytological collections of charophyte materials gathered by R. D. Wood in the Australasian region and described in preliminary reports by Wood (1962*b*) and Hotchkiss (1965), are as follows: WESTERN AUSTRALIA: *Lamprothamnium* sp., Yadgers Brook, 12 miles S of Moora, forming large clump at rock rapids.

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R. D. Wood 60-10-1-5, October 1, 1960; SOUTH AUSTRALIA: *Lamprothamnium macropogon* (A. Br.) Ophel, in one ft. of water, on pipe clay, forming dense carpet under *Ruppia* (?), lagoon near shack, ca. one mi. E of Chinamans Well, 13 mi. SE of Salt Cr., Coorong region. R. D. Wood and C. von der Borsch 60-9-22-1, September 22, 1960. Chromosome number was determined in mitoses in antheridial filaments stained with orcein after fixation in acetic alcohol.



Figs 1-4.

Chromosome complements in *Lamprothamnium* present the appearance of numerous small to medium size chromosomes with about one larger chromosome in every 14 (Figs 1-4). The two new chromosome number determinations in the present report, together with those from the literature, are summarized in Table 1, an enumeration which shows the strongly polyploid nature of the taxa thus far investigated in this genus.

DISCUSSION

The base chromosome number in the Tribe *Chareae* of the Characeae appears to be 14. The new determinations reported here are in accord with this pattern and extend the known chromosome numbers in *Lamprothamnium* to the $n=56$ level. The euploid series of 14, 28, 42 and 56 chromosomes, well known in the large genus *Chara*, is repeated in the 28, 42, and 56 series found thus far in species of the much smaller genus *Lamprothamnium*. It is interesting that the estimate of $n=ca. 50$ for *L. papulosum*, in an early report by Lindenbein (1927) under the name *Lamprothamnus alopecurooides*, has proved to be correct, inasmuch as no number as large as 50 had been proposed for any charophyte up to that time. In Europe several forms of *Lamprothamnium papulosum* (cf. Wood and Imahori, 1965) remain unstudied cytologically. Knowledge of their chromosome number would help clarify their interrelationships.

The combination *Lamprothamnium macropogon* (Braun) Ophel is used here for the plant from South Australia (Wood, 60-9-22-1), with disjunct gametangia and 56 chromosomes. Wood (Wood, 1962a; Wood and Imahori, 1965) designates this taxon as f. *macropogon* (A. Br.) Wood of var. *papulosum* of the 'polymorphic species' *Lamprothamnium papulosum*. The value of disjunct

gametangia as a taxonomic character has been questioned by Wood, but not disproved. The common chromosome number may seem to favour Wood's treatment, but morphological distinctions in the stipulodes and especially in the disjunct (sejunct) gametangia tend to delimit *L. macropogon* as a separate species. On the other hand, the monoecious *Lamprothamnium* with conjoined gametangia (Wood, 60-10-1-5) from Western Australia, previously reported as *Lamprothamnium macropogon* (Hotchkiss, 1963), is designated here simply as *Lamprothamnium* sp. The conjoined gametangia preclude referring this form to *L. macropogon*, while the difference in chromosome number (28 vs. 56) and wide geographical separation are cause for hesitation in assigning it to *L. papulosum* in the absence of abundant study material.

From the data available thus far, the entirely ecorticate, haplostephanous genus *Lamprothamnium* in its cytology appears to be quite far removed from the morphologically similar section of the genus *Chara*, the *Haplostephanae ecorticatae*. It may be noted that the high level of polyploidy in *Lamprothamnium* contrasts sharply with that in *Chara*, *Haplostephanae ecorticatae*, which is almost uniformly at the 14 chromosome level. An exception to this generalization is the monoecious species, *Chara corallina*, reported as $n=42$ by Sarma and Khan (1965). *Chara corallina*, however, appears to be a special case in the *Haplostephanae ecorticatae*, and to bear little relation to the polyploid series in *Lamprothamnium* which begins at the 28 chromosome level. Another distinction may be seen in the lower (14, rarely 28) polyploid levels found in species with disjunct gametangia (and also in dioecious species) throughout the genus *Chara* which contrasts with the higher polyploid levels of the gametangially disjunct species of *Lamprothamnium*.

Cytological data can be correlated with other factors in a preliminary evaluation of the geographical distribution of *Lamprothamnium*. The wide range of chromosome number found in the Australasian region exceeds that reported from elsewhere in the world and includes the lowest number now known in the genus. *Lamprothamnium macropogon* is Australian, *L. succinctum* extends along a well known arc of plant distribution ranging from Australasia through the Indian Ocean to Africa. These considerations, together with a considerable range of morphological variation in the Australasian region, suggest the hypothesis that this area is a centre of distribution for the genus.

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